DOCUMENT RESUME

ED 163 067 TM 008 130

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TITLE	A Current View of Soviet Research in Cognitive Psychology.
PUB DATE	Oct 77
NOTE	8p.; Paper presented at the Annual Meeting of the Northeastern Educational Research Association (Ellenville, New York, October 26-28, 1977) ; Best copy available
EDRS PRICE	MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS	Abstract Reasoning; Cognitive Development; *Cognitive Processes; *Concept Formation; Elementary Education; Environmental Influences; Foreign Countries; *Learning Theories; *Mathematical Concepts; *Psychological Studies; Research Reviews (Publications); Sequential Learning; *Teaching Methods
IDENTIFIERS	Piagetian Theory; *USSR

ABSTRACT

Research conducted at the Institute of General and Pedagogical Psychology of Moscow, and based on the premise that the development of thought processes is a direct product of the social environment, is described. As a corollary to this premise, Piaget's view that the development of the thinking process occurs in orderly fashion is questioned. Evidence provided by Soviet researchers purports to demonstrate that children are able to learn to think abstractly before learning to solve the same problems in concrete fashion, when appropriate teaching methods are used. A mathematics training project in which children progress from abstract to concrete concepts is described. Children begin by learning the abstract concepts of measurement, greater than, less than, and equal to. These concepts are used to introduce basic algebraic concepts and the concrete numbering system. Children are instructed to describe problem-solving situations using equations before they are able to apply numbers to the problem or perform basic addition or subtraction processes. This study illustrates how children were able to produce basic formulas for problem-solving even before learning the specific procedure for counting. (Author/JAC)

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A Current View of Soviet Research in Cognitive Psychology[1]

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This report discusses research primarily of the Institute of General and Pedagogical Sciences of the U.S.S.R. The author was Research Exchange Scientist in Moscow January-June, 1977 under the auspices of the Academies of Science of the U.S. and U.S.S.R., and consulted during the time with research psychologists in laboratories and institutes in Moscow, Leningrad, and Tbilisi.

Introduction

Soviet and western approaches to research in cognitive psychology have a number of basic similarities and differences that should be considered prior to discussion with American psychologists of Soviet research findings. The basic premise underlying research in both camps is similar, that is, both Soviets and westerners agree that human thinking processes and behavior are, in large part, a function of interaction with the environment. The extent to which emphasis is placed by researchers on the role of this environment as it affects problem solving behavior, however, differs considerably in the Soviet Union and in the west. Western researchers have been concerned, for example, with tracing changes in thinking that occur with age, under conditions of "normal' stimulation. Some have been involved with factors in producing behavior.

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[1] Paper presented at the annual Northeastern Educational Research Association meetings, Ellenville, New York, October 26-28, 1977.

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Soviet researchers are not interested at all in prooving the role of the social environment in affecting problem-solving behavior; they begin their research with unquestioned acceptance of this role. Nor are researchers in the mainstream ("Moscow school") of Soviet pedagogical psychology interested in what they consider to be peripheral factors such as genetics.[2] Research is designed with the intent of demonstrating ways that the social environment affects learning, and, further, manipulating this environment so as to produce maximal desired learning. For this reason, Soviets, unlike their American counterparts, make use only rarely of experimental methods and use, instead, primarily demonstrations to provide evidence. Current research at the Institute of General and Pedagogical Psychology provides a good example of this approach.

Research at the Institute of General and Pedagogical Psychology

The goal of researchers in each of the laboratories directed by the Institute of General and Pedagogical Psychology is to demonstrate that the development of the thought processes is a direct product of the social environment. For the past fifteen years, pedagogical psychologists at the Institute have had as one of their goals refuting some of the basic Piagetian tenets. These psychologists accept Piaget's view that development of the thinking processes occurs in orderly fashion. They reject the view, however, that the order is necessarily fixed, and suggest that, by arranging new structure for learning experiences, they can change not only the speed at which children learn, but the order in which stages take place. Specifically, a main goal

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[2] There are, of course, psychologists interested in genetics. These psychologists, however, are employed primarily in institutes such as the Institute of Defectology in Moscow where ongoing research involves primarily the solving of health problems.

of research is demonstration of the fact that it is impossible to separate ability to perform abstract functions from the cultural environment, and that even young children have capability of learning abstractly.

The true don of this approach now widely accepted in the Soviet Union is Professor P. Ia. Galperin, longtime chairman of the program of child psychology at Moscow State University[3]. Professor Galperin and his associates, in developing their approach, have used the teaching of grammar as one of many vehicles to show how the thinking processes develop (Galperin, 1976). They begin the teaching of grammar with analysis of single words. The process begins with students learning the meaning of basic phonemic units. Students gradually are taught to associate these units as functional carriers of meanings. At the same time, they develop what Galperin calls a problem-solving orientation to language. Learning finally is reinforced through provision of many concrete examples. Only at the last, students are taught the names of the grammatic functions they have been studying.

Among Galperin's many former students is VV Davydov, now Director of the Institute of General and Pedagogical Psychology. Pedagogical psychologists at Davydov's institute are interested primarily in one aspect of the social environment, that is, the specific planned educational experience. To investigate the thought processes of small children, these researchers have utilized special courses in mathematics, linguistics, and other subject matters in which children are

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[3] In the Soviet university system, a "kafedra" or program is contained within a "faculty" or department. However, in a university as large as Moscow State University, each program contains as many professors, and exercises more or less as much academic autonomy, as a normal department in U.S. universities.

required to progress, not from concrete to abstract, but from abstract to concrete. Recently the institute obtained a laboratory school in which these demonstration programs can progress from the earliest grade through to middle school. This report describes only one of these programs, that of mathematics training.

The program in mathematics at Experimental School #91, developed by Davydov, has roots in research conducted both at the Institute of General and Pedagogical Psychology, and also at the Pedagogical Psychology Program at Moscow State University. Researchers in the program noted that, using traditional methods of teaching mathematics, even children with the highest grades in their first year could not solve Piagetian tasks requiring abstract ability. They therefore developed new methods for teaching mathematics. The method studied at Moscow State University begins with children learning the abstract concept of measure. Children learn, in the early months of the program to measure length, width, and volume, using any objects available to them for the purpose. From this early step, they progress rapidly to the abstract concept of "measurement," and then to abstract concepts such as "greater than, less than, and equal to". Finally, children use these concepts to describe relationships between quantities and measures. The last principle involved, according to researchers, is the careful arrangement of subject matter in such a way that interference is reduced. When this is accomplished, abstract concepts can be taught at very early ages (Salmina and Sochina, 1975).

The demonstration mathematics program in Experimental School #91 uses a similar approach, with some major additions. Children studying with Davydov's approach begin by learning the concepts of "measurement," "greater than," "equal to," and "less than." These concepts are used to

introduce basic algebraic concepts before the introduction of what Davydov terms the "concrete" numbering system. Children are instructed to describe problem-solving situations using equations before they are able to apply numbers to the problem or perform basic addition or subtraction processes. In a class of first form children, for example, I observed children presented with the following problem:

> "A collective farm has a large amount of grain at the harvest season. Some of it is taken away to be used for the people in the city. How much is left in the warehouse for the peasant?"
>
> To solve this problem, the children decided the following:
>
> a = number of sacks of grain
>
> b = amount taken away
>
> c = sacks of grain left
>
> The correct answer, provided on the board by one of the students, was:
>
> a - b = c

Children in a demonstration first form class at experimental school #91 were able to demonstrate that they could produce basic formulas for problem-solving even before they learned the specific procedure for counting. Davydov's program in the experimental school deals with teaching children beginning at age seven, when they enter the first form. In recent years, researchers at the Institute of Preschool Education have become interested in studying the use of Davydov's method with younger children. At the Laboratory for Preparation for the First Grade of the Institute of Preschool Education,

researchers demonstrated that younger children are able to solve algebraic equations without first mastering the number system. Research has been conducted with children as young as three an four years of age. Children here, as in Experimental School #91, begin by learning the abstract concept of measure, follow with development of use of algebraic equations, and, finally, learn the numbering system.

Results and conclusions

How effective are these programs? The results of the demonstration program at Experimental School #91, reported by the Director of Psychological Research, (Mikulina, 1977), show the following:

1. Although tests administered by the Ministry of Education to all Moscow schoolchildren at the end of forms 8 and 10 show that demonstration students score slightly less well, on independent tests developed by Davydov and his associates to solve new and unexpected mathematics problems, children learning by his method score much higher. Presumably, the new method allows for a greater number of creative and innovative responses.
2. Although children selected for the demonstration mathematics program are chosen only by the microdistrict in which they live, and probability of these children having home environments significantly different from others in the city is extremely low, still a higher percentage of students completing this program go on to higher education than would be anticipated with traditional methods of instruction.

Soviet researchers suggest that there may be some problems, however, in using these studies to prove that abstract thinking can occur before concrete. They point out that in order to learn the abstract concept of measurement in the first place, children must gain concrete experience in measuring (Kotetishvili, 1977). Clearly, the final test to determine whether this new method affects abstract thinking should involve presenting abstract Piagetian tasks to children who have learned with this method. Although the ability of children to solve abstract problems in school tasks admittedly is very impressive, this data has not yet been provided.

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